

WHAT IS CLAIMED IS:

1. A fluid leakage detection apparatus comprising:
 - a high-pressure fluid supply source;
 - a fluid passage that passes the fluid from one end that locates at an upstream side close to the fluid supply source to the other end that locates at a downstream side;
 - a first valve and a second valve each provided on an intermediate portion of the fluid passage from the upstream side;
 - a detecting portion that detects a pressure of the fluid within a detection range between the first valve and the second valve;
 - an adjusting portion that adjusts a pressure within the detection range into a predetermined reference pressure, a pressure upstream of the first valve to be higher than the predetermined reference pressure, and a pressure downstream of the second valve to be lower than the predetermined reference pressure, respectively by operating the first valve and the second valve; and
 - a determining portion that determines the leakage of the fluid based on a change in the detected pressure.
2. The fluid leakage detection apparatus according to claim 1, wherein the determining portion determines that the first valve has the leakage of the fluid when the detected pressure of the fluid within the detection range becomes higher than the predetermined reference value.
3. The fluid leakage detection apparatus according to claim 1, wherein the determining portion determines that one of the second valve and the fluid passage within the detection range has the leakage of the fluid when the detected pressure of the fluid within the detection range becomes lower than the predetermined reference pressure.
4. The fluid leakage detection apparatus according to claim 1, wherein the

adjusting portion closes the first valve that has been held in an opened state, and upon elapse of a predetermined time period from closing of the first valve, further closes the second valve that has been held in an opened state.

5. The fluid leakage detection apparatus according to claim 4, wherein the determining portion determines that the first valve has the leakage of the fluid when the detected pressure within the detection range is higher than a predetermined pressure in a period from a time at which the first valve is closed to a time at which the second valve is closed.

6. The fluid leakage detection apparatus according to claim 1, wherein the adjusting portion closes the first valve after closing the second valve, and operates the closed second valve thereafter such that the pressure within the detection range becomes the predetermined reference pressure.

7. The fluid leakage detection apparatus according to claim 6, wherein the determining portion determines that one of the second valve and the fluid passage in the detection range has the leakage of the fluid when the detected pressure within the detection range becomes lower than a predetermined pressure in a period from a time at which the second valve is closed to a time at which the second valve is operated.

8. The fluid leakage detection apparatus according to claim 1, further comprising a fluid utilizing mechanism provided downstream of the second valve so as to be operated with the fluid, and

wherein the adjusting portion serves to operate the fluid utilizing mechanism for reducing a pressure downstream of the second valve.

9. The fluid leakage detection apparatus according to claim 8, wherein the fluid utilizing mechanism comprises a fuel cell, and the fluid comprises hydrogen.

10. The fluid leakage detection apparatus according to claim 1, further comprising:

- a supply pipe connected to the detection range, and that supplies the fluid thereto;

- a check valve provided with the supply pipe, and that prevents a reverse flow of the fluid from the detection range to the supply pipe; and

- a reverse flow prevention portion provided for reducing a pressure of the fluid within the supply pipe prior to determination of the leakage.

11. A fluid leakage detection method of detecting a leakage of a fluid in a system including a high-pressure fluid supply source, a fluid passage that passes the fluid from one end that locates at an upstream side close to the fluid supply source to the other end that locates at a downstream side, and a first valve and a second valve each provided on an intermediate portion of the fluid passage from the upstream side, the fluid leakage detection method comprising the steps of:

- detecting a pressure of the fluid within a detection range between the first valve and the second valve;

- adjusting a pressure within the detection range into a predetermined reference pressure, a pressure upstream of the first valve to be higher than the predetermined reference pressure, and a pressure downstream of the second valve to be lower than the predetermined reference pressure, respectively by operating the first valve and the second valve; and

- determining the leakage of the fluid based on a change in the detected pressure.

12. The fluid leakage detection method according to claim 11, wherein it is determined that the first valve has the leakage of the fluid when the detected pressure of the fluid within the detection range becomes higher than the predetermined reference value.

13. The fluid leakage detection method according to claim 11, wherein it is

determined that one of the second valve and the fluid passage within the detection range has the leakage of the fluid when the detected pressure of the fluid within the detection range becomes lower than the predetermined reference pressure.

14. The fluid leakage detection method according to claim 11, wherein the first valve that has been held in an opened state is closed, and upon elapse of a predetermined time period from closing of the first valve, the second valve that has been held in an opened state is further closed.

15. The fluid leakage detection method according to claim 14, wherein it is determined that the first valve has the leakage of the fluid when the detected pressure within the detection range is higher than a predetermined pressure in a period from a time at which the first valve is closed to a time at which the second valve is closed.

16. The fluid leakage detection method according to claim 11, wherein the first valve is closed after closing the second valve, and the closed second valve is operated thereafter such that the pressure within the detection range becomes the predetermined reference pressure after closing of the first valve.

17. The fluid leakage detection method according to claim 16, wherein it is determined that one of the second valve and the fluid passage in the detection range has the leakage of the fluid when the detected pressure within the detection range becomes lower than a predetermined pressure in a period from a time at which the second valve is closed to a time at which the second valve is operated.

18. The fluid leakage detection method according to claim 11, wherein a fluid utilizing mechanism provided downstream of the second valve is operated with the fluid for reducing a pressure downstream of the second valve.

19. The fluid leakage detection method according to claim 11, wherein a

reverse flow of the fluid from the detection range to a supply pipe connected thereto for supplying the fluid is prevented, and a pressure of the fluid within the supply pipe is reduced prior to determination of the leakage.